Multimodal Traffic Management 2

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Collaboration between LiU and KTH

Funded by Trafikverket through CTR

Projektgrupp

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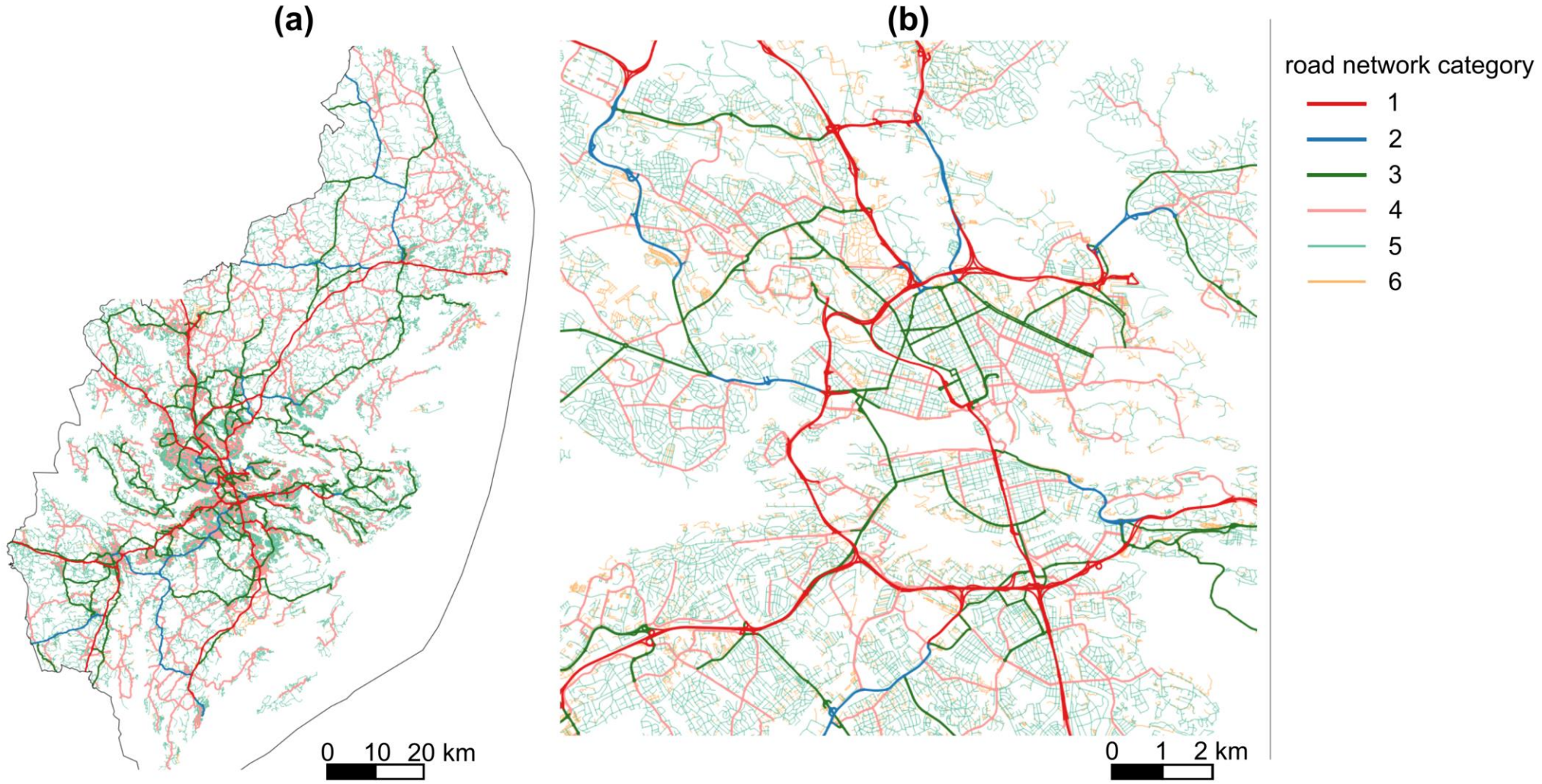
Multimodal traffic management

- The four-step principle combined with urbanization means that traffic systems are often managed at the capacity limit.
- Small changes in supply can have a large impact on system performance and significant socioeconomic effects.
  - It is important to have good decision-making support and analysis tools for management and control.
- The long-term goal is to be able to evaluate and monitor action plans in real time

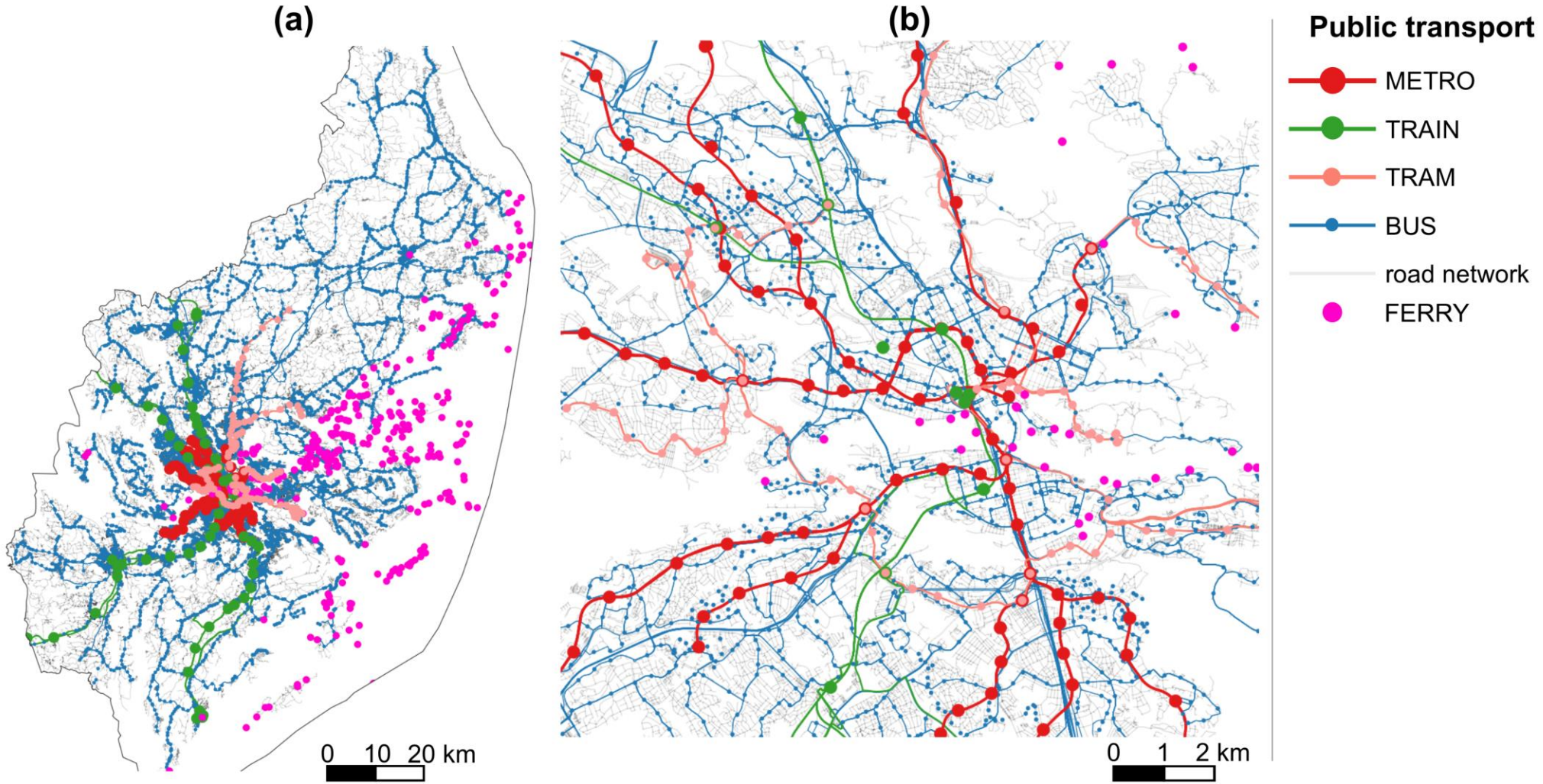
Overall project goal
• Better understanding of multimodal travel patterns • New methods for estimating and predicting multimodal demand • New methods for predicting mode and route choice • Identify synergies and challenges with multimodal traffic management

Questions related to incident managment
• How can we predict traffic state during incidents (including the effects of route and mode choice)? • Which traffic flows are most affected by the incident (and have the greatest impact on the incident)? • What multimodal redirection options are available for these traffic flows? • How does the redirection affect future traffic states?

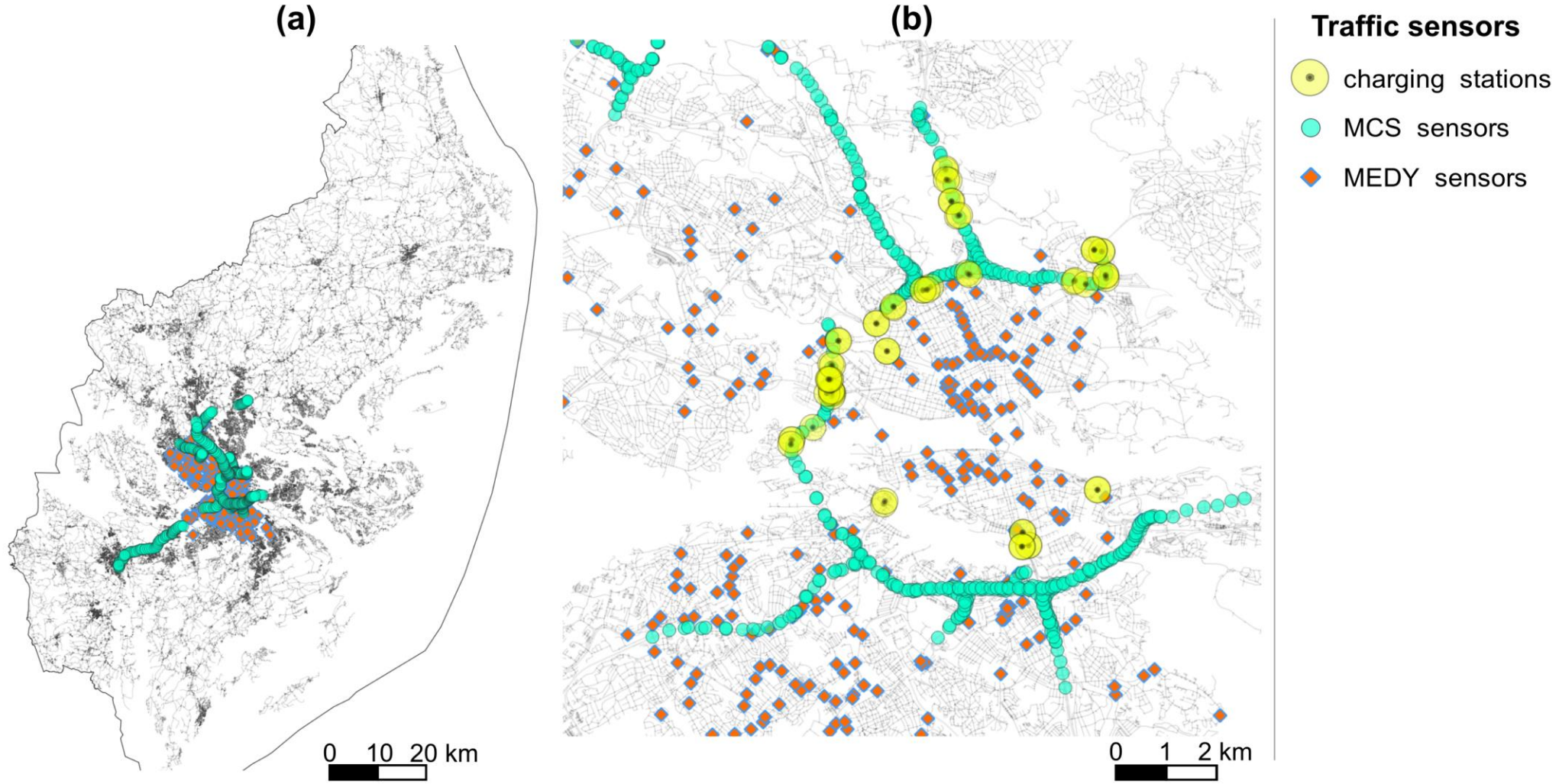
Road network Stockholm



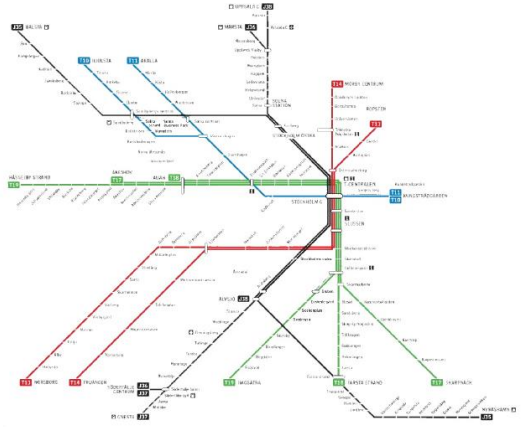
Public transport network



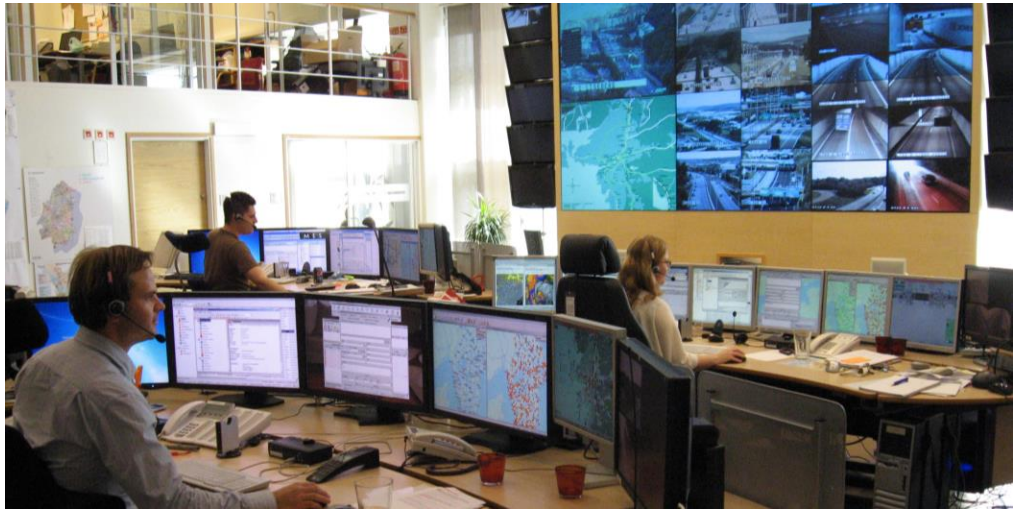
Stationary sensors

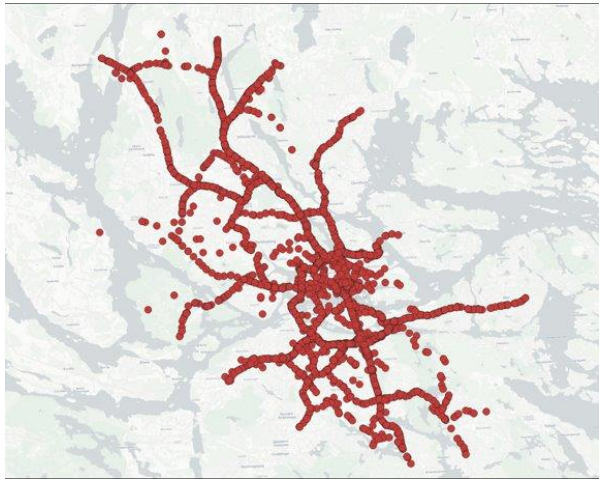


Data sources for multimodal traffic management

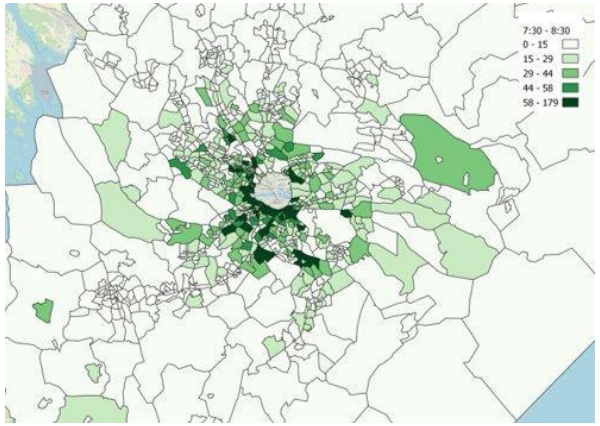


Public transport tap-in data

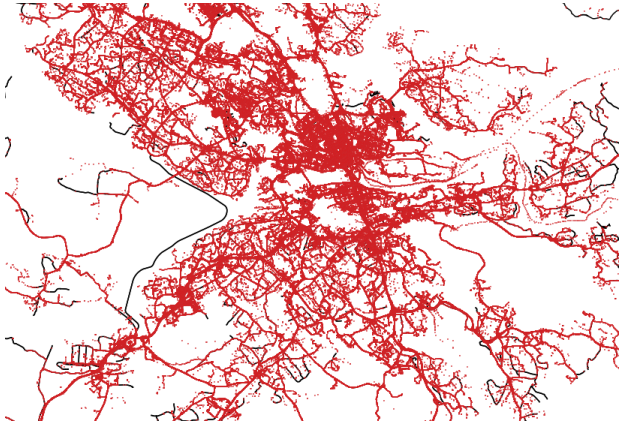




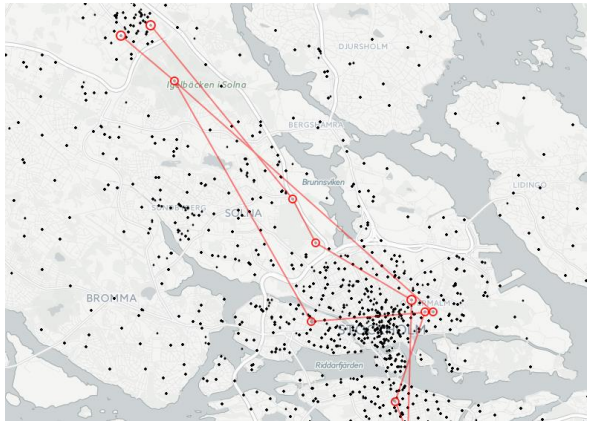
Incident data



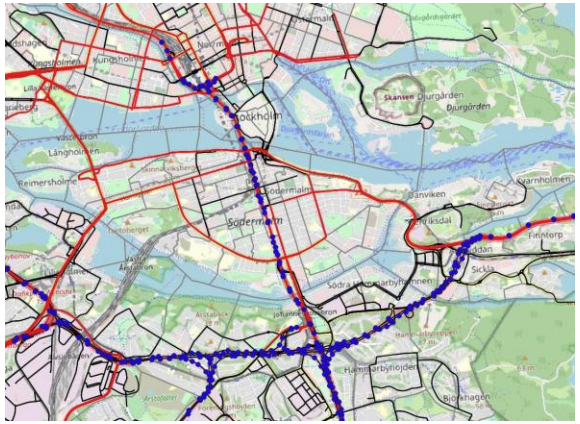
Congestion charging portal data



INRIX and TomTom data

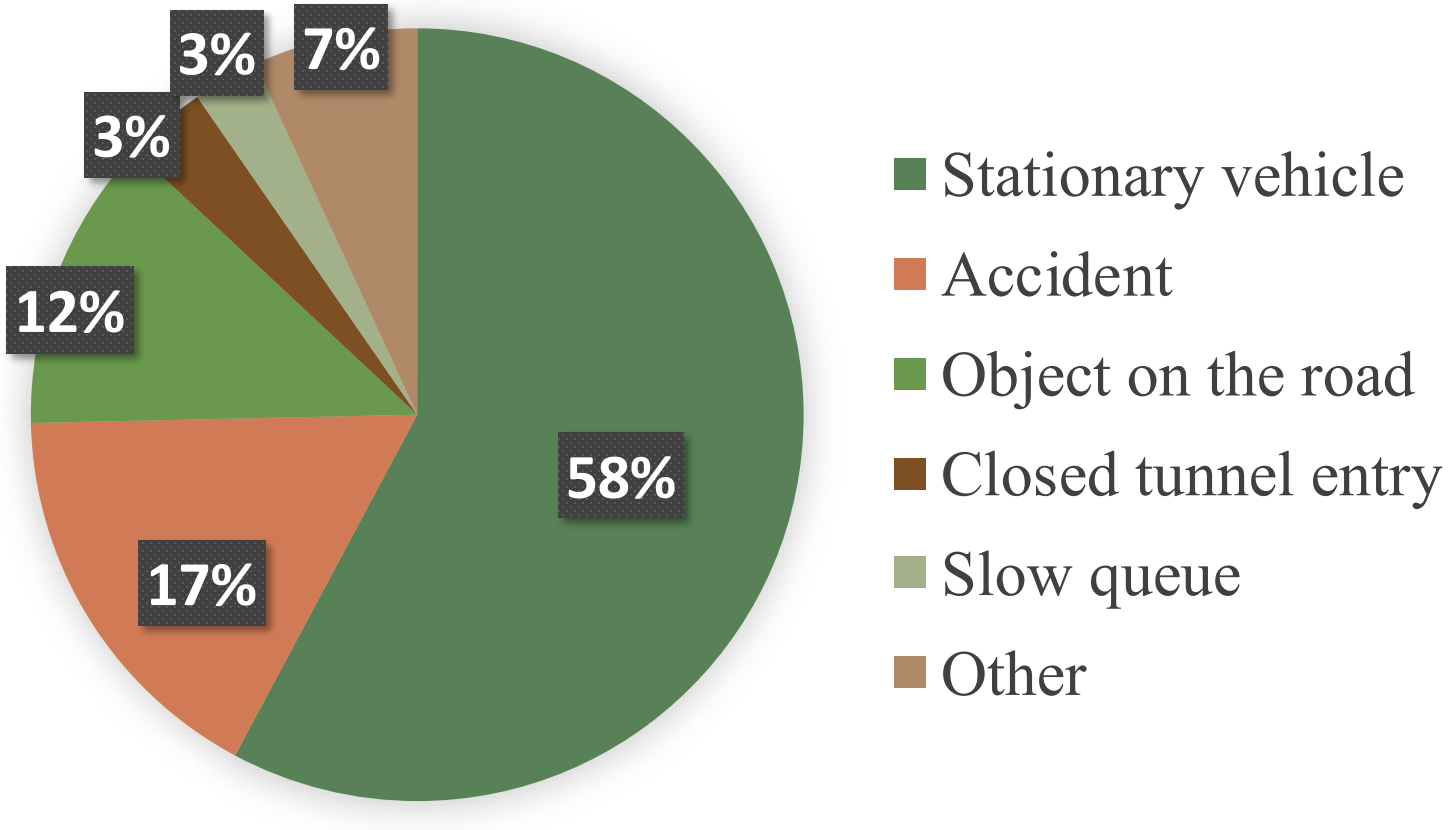


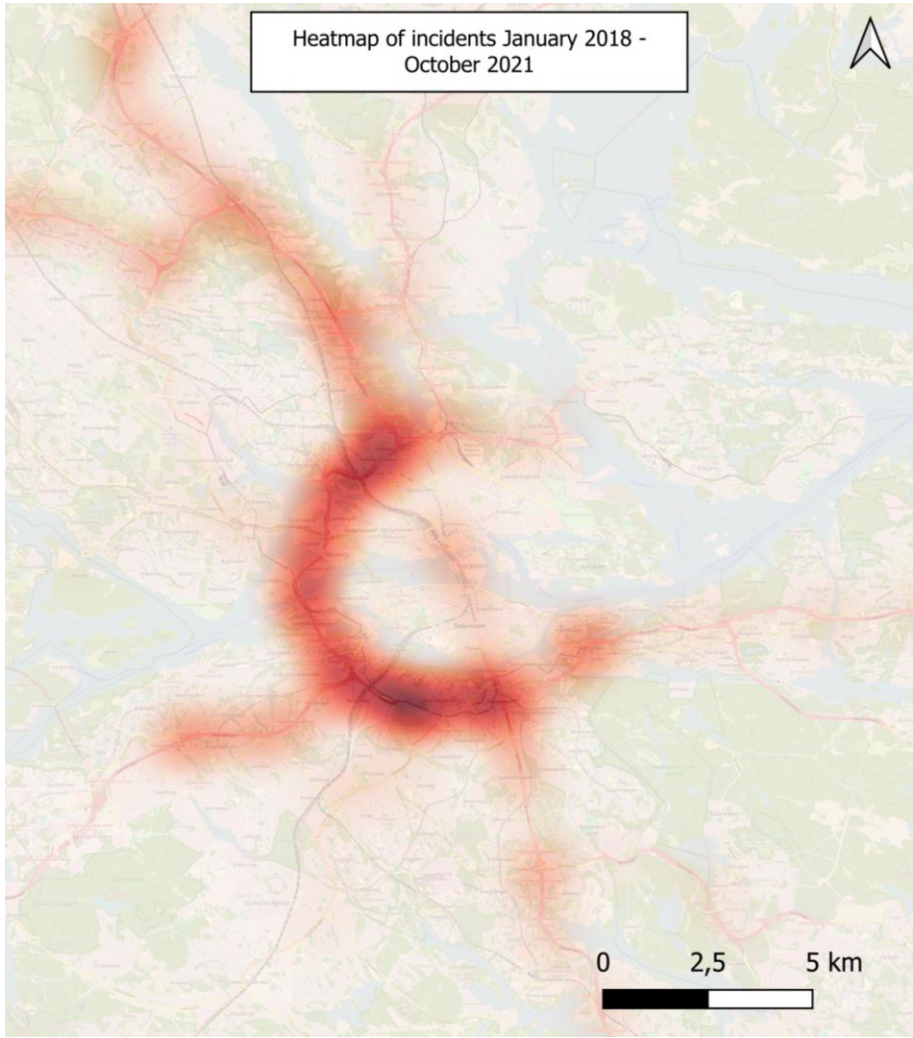
Mobile network data



MCS data

Incident data





Incidenters påverkan på ruttval

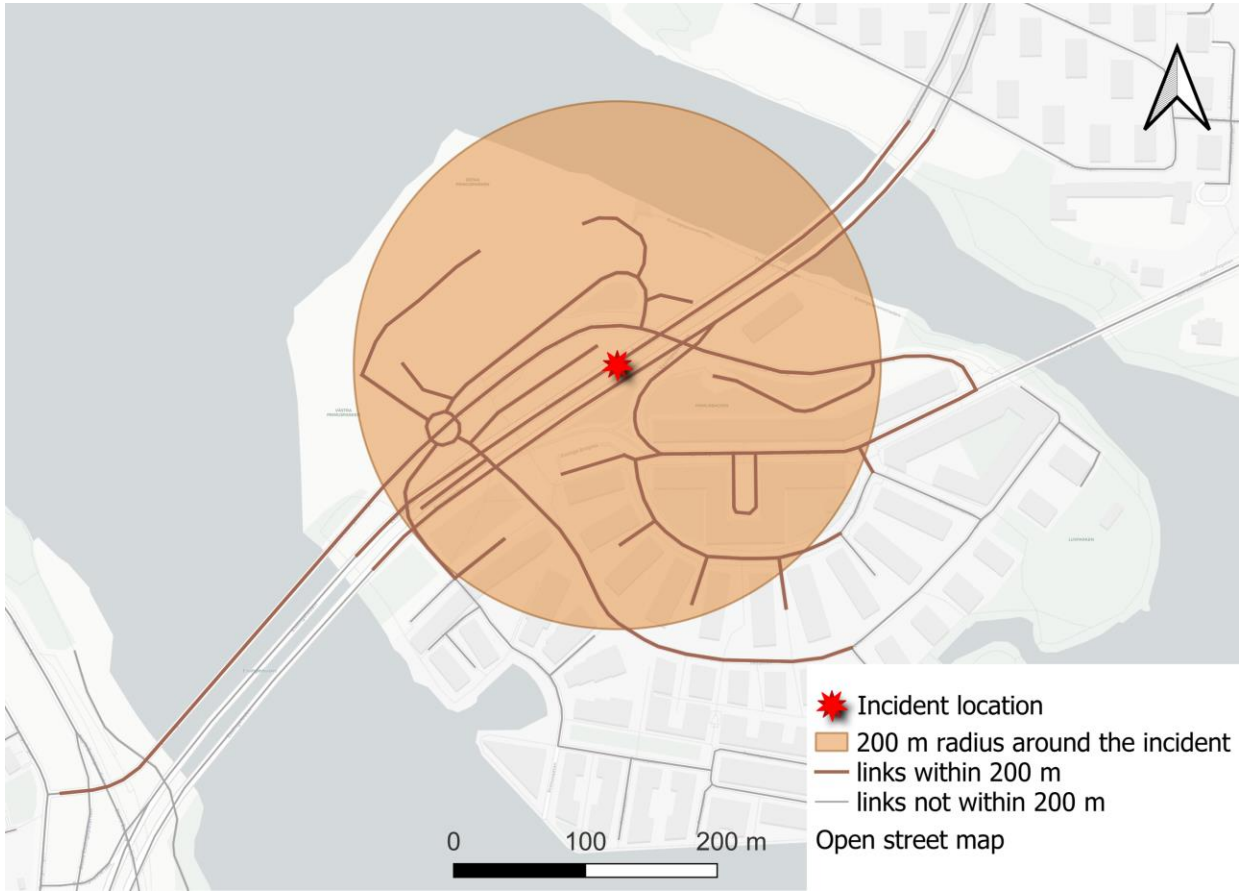
Incident impact on route choice

Mapping of incidents to the road network

The incident is located on the link that

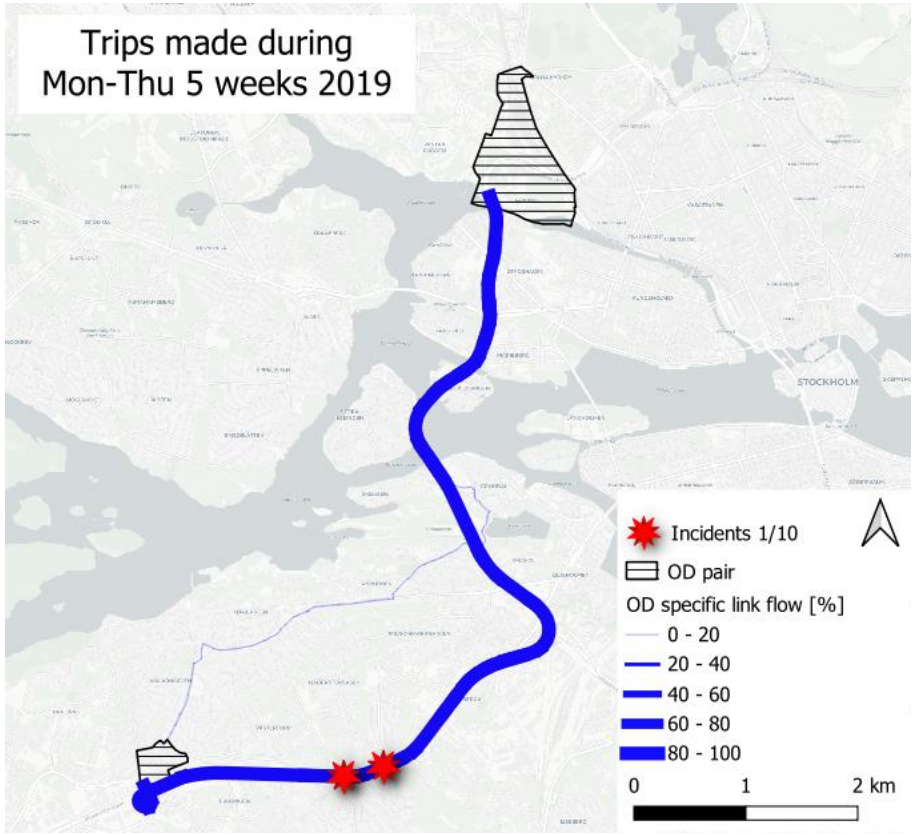
- has the largest mean speed deviation from normal speed
- is within 200 m from the reported location
- has more than on average 10 vehicles/hour in the GPS data set
- has more than 1 vehicle in the time interval of +/- 1h from the reported time of the incident
- has an open street map road class of less than or equal to 4

Incidents mapped to the same link with overlapping time intervals are grouped



Data-driven route identification

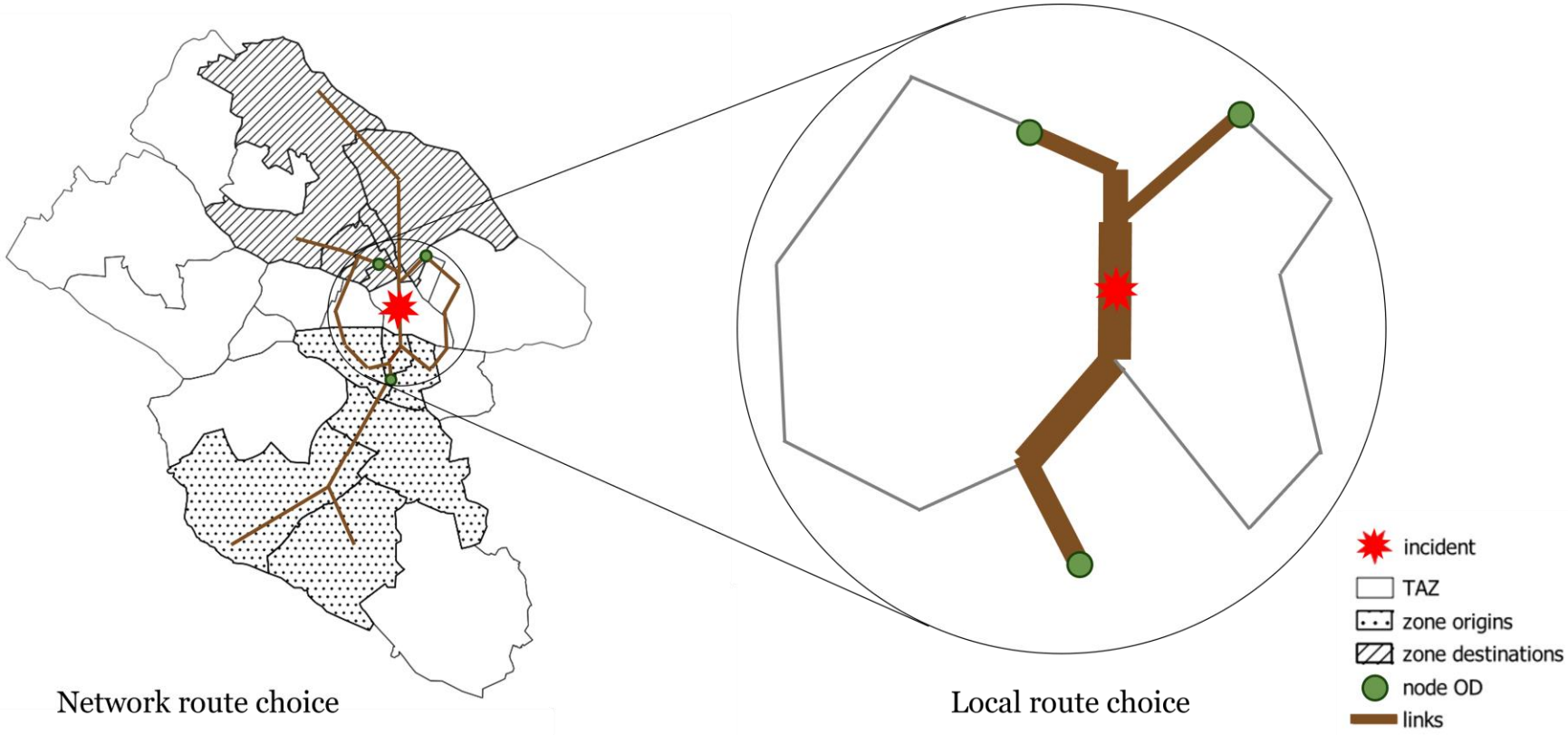
- Historical GPS trajectories and the calculated shortest path are used to identify routes
- Routes that are too similar are considered the same
- Routes are filtered out based on their length, the number of vehicles using the route, and detected errors in the data collection
- Routes are divided into
  - *Incident routes*
  - *Alternative routes*



Danielsson, A., Gundlegård, D., and Rydergren, C. ”Analysis of route sets and attributes in route choice estimation for urban traffic management using GPS-data", in *TRB 103rd Annual Meeting Compendium of Papers*, Transportation Research Board, Washington D.C., USA, January 7th-11th 2024.

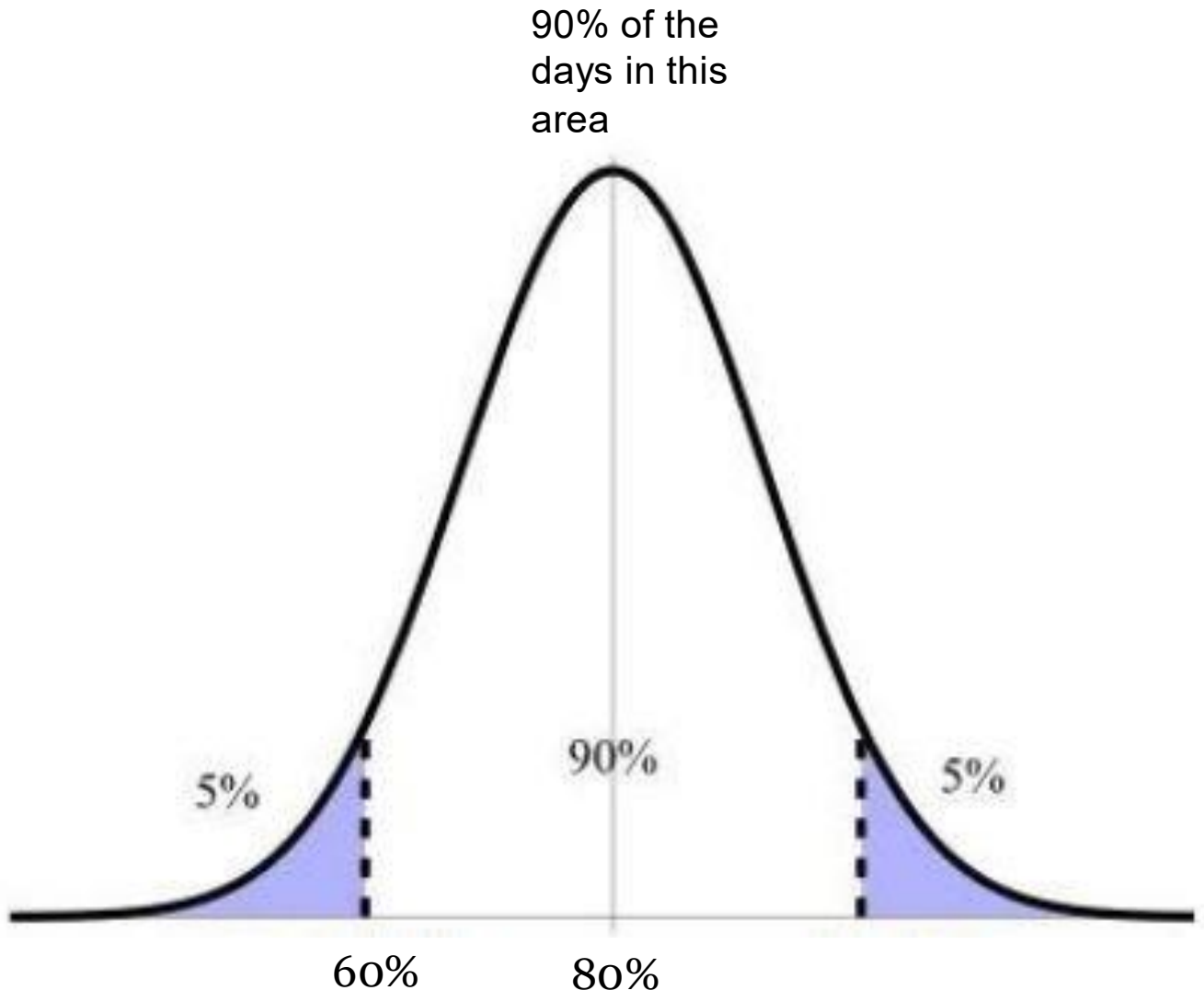
Incident effect on route choice

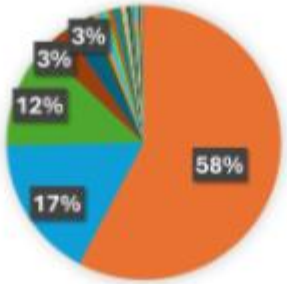
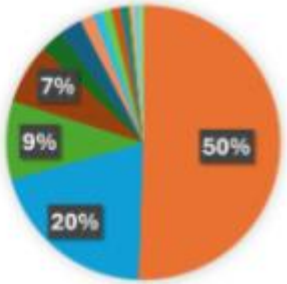
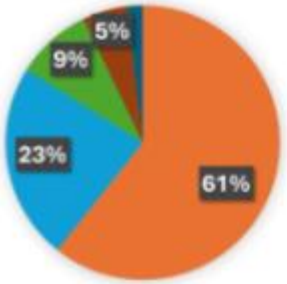
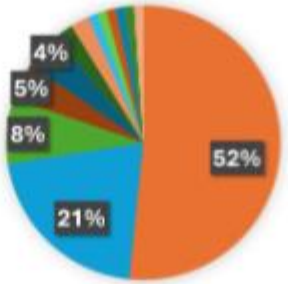
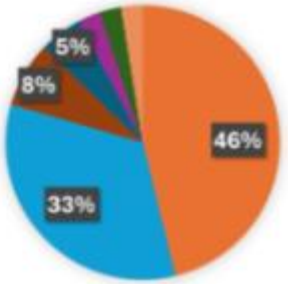
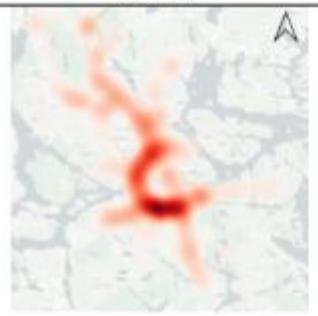
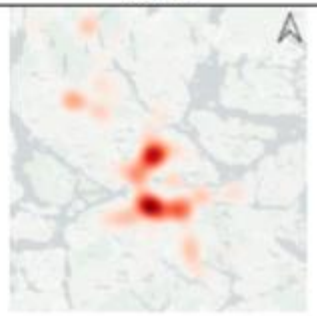
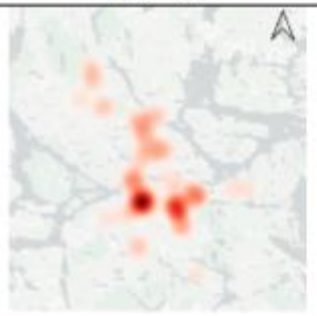
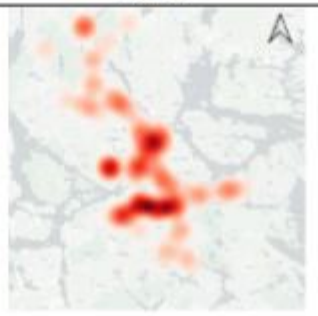
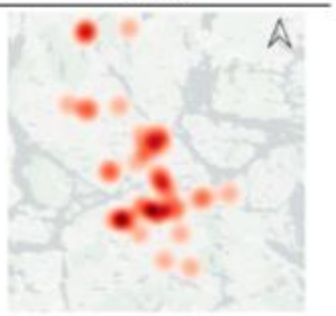
- Effect on
  - Speed reduction
  - Route choice on network level
  - Route choice on local level



Incident impact

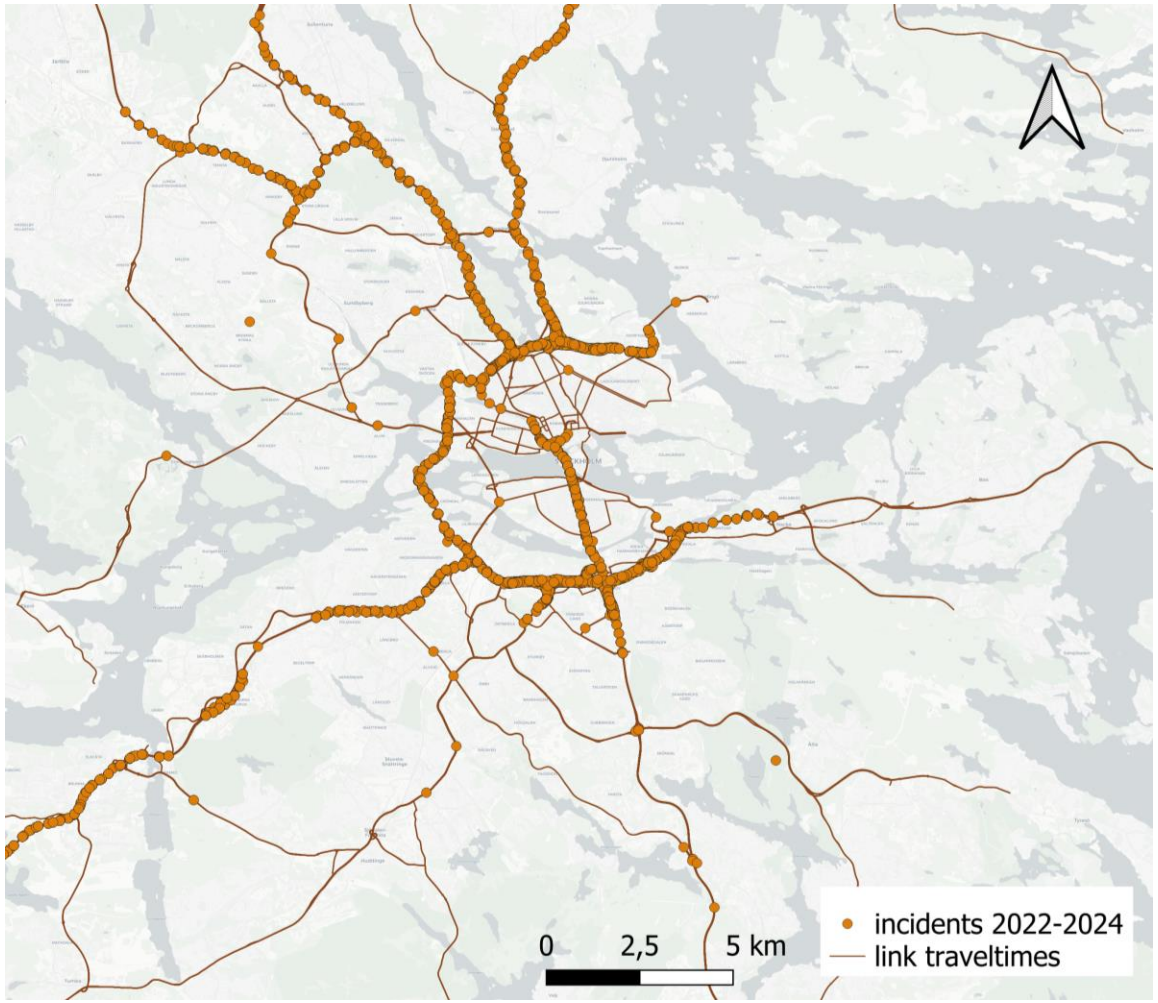
- Share of travelers on an incident route is compared between normal and incident day.
- Large deviation on the incident day compared to normal days indicates incident impact.
- Statistics of the incidents with impact are analysed.



	All incidents	Impact on speed reduction ($> 95th$ percentile)	Impact on network route choice ($< 5th$ percentile)	Impact on local route choice ($< 5th$ percentile)	Impact on local route choice ($< 1st$ percentile)
Number of incidents	1209	184 out of 1209	56 out of 1115	91 out of 770	39 out of 770
Share of incidents	100 %	15 %	5 %	12 %	5 %
Event type ■ Stationary vehicle ■ Accident ■ Object on the road ■ Closed tunnel entry ■ Slow queue					
Avg incident duration	36 min and 6 sec	42 min and 50 sec	36 min and 28 sec	39 min and 53 sec	41 min and 35 sec
Avg speed reduction on incident link during incident day	23 %	29 %	17 %	25 %	30 %
Share on highways	68 %	64 %	79 %	67 %	72 %
Share in peak hours	54 %	60 %	50 %	62 %	54 %
Heat map					

Conclusion and next steps

- 5-12 % of the incidents have an effect on the route choice
- Up to 20 % of the travelers change to an alternative route
- Data for 2022-2024 in Stockholm
  - Incidents
  - Link traveltimes
  - Mobile network OD data
- Multimodal metrics of incident effects
  - Incident impact on mode choice



Project web page:

Thank you!

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LINKÖPINGS UNIVERSITET

KTH VETENSKAP OCH KONST